DOCUMENT RESUME

ED 050 829 24 PS 004 803

AUTHOR Towler, John O.
TITLE A Study of the Development of Egocentrism and the Coordination of Spatial Perceptions in Elementary School Children. Final Report.
INSTITUTION Purdue Research Foundation, Lafayette, Ind.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO BR-8-E-130
PUB DATE Dec 69
GRANT OEG-5-9-245130-0013(010)
NOTE 39p.

EDRS PRICE EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS Age, *Concept Formation, Elementary School Students, Intellectual Development, *Perception, Rural Environment, *Self Concept, Socioeconomic Status, *Space Orientation, Tables (Data), Urban Environment

ABSTRACT

This study developed from the hypotheses: (1) there is a sequential pattern in the development of children's abilities to coordinate perspectives, and (2) use of an urban environment in the Test of Coordination of Perspectives will result in an earlier development of the age-stage relationships tested by Piaget and Inhelder (Switzerland, 1963). Statistically tested hypotheses were: (1) there are significant correlations between the ability to coordinate perspectives and chronological age, intelligence, socio-economic status, and knowledge of left-right relationships; and (2) there is a significant difference in the mean scores of high and low socio-economic groups on the Test of Coordination of Perspectives when the effect of intelligence is removed, and also a difference between subjects living in urban as opposed to rural environments on the same test. The study involved the administration of an intelligence test, a test of right-left relationships and the Test of Coordination of Perspectives to 140 children from kindergarten to grade six, 5.0 to 12.7 years of age, enrolled in two schools reflecting high and low socio-economic classes, rural and urban environments. Results proved hypothesis 1 acceptable; 2 was not. The finding that there are differences in the developmental stages of children of the same age but with different IQs indicates that Piaget's age-stage relationships may be more closely allied to intelligence than to maturation and experience. (AJ)

ED050829

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

PA-24
BR-8-E-130

Final Report
Project No. 8-E-130
Grant No. OEG-5-9-245130-0013 (010)

A STUDY OF THE DEVELOPMENT OF EGOCENTRISM AND THE COORDINATION OF SPATIAL PERCEPTIONS IN ELEMENTARY SCHOOL CHILDREN

John O. Towler

Purdue Research Foundation

Lafeyette, Indiana 47907

December, 1969.

The research reported herein was performed pursuant to a grant with the Office of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgement in the conduct of the project. Points of view or opinions stated do not, therfore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION AND WELFARE

Office of Education
Bureau of Research

PS 004803

ACKNOWLEDGEMENTS

The author wishes to express his gratitude to the following people whose help contributed to the success of the study.

The principals and staffs of Morton and Hershey Schools for their cooperation and provision of facilities.

Beverly Koepper, Carolyn Land, Ann Rose and Tara Torgerson for their help in administering the tests and setting up the data.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	THE PROBLEM, ITSN NATURE AND SIGNIFICANCE.....	1-5
	Introduction.....	1-4
	Rationale.....	4-5
	Research Hypotheses.....	5
II.	THE EXPERIMENTAL DESIGN AND METHODOLOGICAL PROCEDURES.....	6-12
	A Description of the Procedures.....	6
	The Sample.....	6
	The Pilot Study.....	7
	The Instruments.....	7
	Subtest I.....	7-10
	Subtest II.....	10-12
	Subtest III.....	12
	Reliability and Validity.....	12
	The Statistical Analysis.....	12
III.	RESULTS AND ANALYSES.....	13-24
	The Results of the Test of Right-Left Relationsiips.....	13
	The Results of the Test of Coordination of Perspectives.....	14
	Subtest I.....	14-15
	Subtest II.....	15
	Subtest III.....	16
	Total Scores on the TCP.....	16
	Intercorrelations of the Subtests in the TCP.....	17

PAGE

The Statistical Analyses of the Data..... 17

Hypothesis 1..... 18

Hypothesis 2..... 18

Hypothesis 3..... 18

Hypothesis 4..... 18

Hypothesis 5..... 19

Hypothesis 6..... 19

Clinical Observations Based on the Testing Situation..... 20

The Test of Right-Left Relationships..... 20

The Test of Coordination of Perspectives..... 20-23

A Comparison of the Stages of Development with Piaget's..... 23-24

IV. CONCLUSION, IMPLICATIONS AND SUGGESTION FOR FURTHER RESEARCH..... 25-28

Discussion of the Findings..... 25-28

The Hypotheses..... 25-26

The Age-Stage Relationships..... 27-28

Knowledge of Left-Right Relationships..... 28

Implications..... 28-30

Psychological Aspects..... 28-29

Educational Aspects..... 29-30

Suggestions for Further Research..... 30

REFERENCES..... 31

APPENDIX A..... 32-33

APPENDIX B..... 34

LIST OF TABLES

TABLE		PAGE
I.	Mean Scores on the Test of Right-Left Relationships	13
II.	Mean Scores on Subtest I, TCP	15
III.	Mean Scores on Subtest II, TCP	15
IV.	Mean Scores on Subtest III, TCP	16
V.	Combined Mean Scores of the Subtests in the TCP	17
VI.	Intercorrelations of the subtests and Combined TCP Scores	17

LIST OF FIGURES

FIGURE		PAGE
1.	One of the Models Used in the Test of Coordination of Perspectives	8
2.	The Orientation of the TCP Models	9
3.	The Physical Setting for Subtest II	11

CHAPTER I

THE PROBLEM, IT'S NATURE AND SIGNIFICANCE

I. INTRODUCTION

There is considerable interest concerning the manner in which children think and the way in which they form concepts. However, we are currently faced with a multitude of curricula which are based on little more than simple assumptions regarding what children can learn and when they might best learn it.

One area of concept formation which has relevance for a great many subject areas is that of the child's concept of space. Studies by Piaget and his colleagues (1963) have indicated that a child's spatial concepts affect his understanding in such areas as geometry, trigonometry, physics, general science and, as they apply to his spatial orientation, geography and the social studies.

Piaget and Inhelder (1963) investigated children's spatial concepts and have stated that they develop in a certain sequence according to age. For instance, they state that the child does not develop the ability to coordinate perspectives until approximately the age of 10 years. The concept of coordination of perspectives may be defined as the ability to recognize one's own viewpoint as separate and distinct from another person's viewpoint while at the same time realizing that an object viewed from another perspective may yield a different configuration.

However, Piaget and Inhelder's study was conducted with Swiss children over 20 years ago and in the interim, very few studies have attempted either to replicate or extend their findings with relation to American children at the present time. As a result, we may know relatively little about the development of American children's spatial concepts and the effects of these concepts in certain curriculum areas. Hence, it was the purpose of this study to investigate the development of children's spatial concepts as they pertain to the ability to coordinate perspectives.

One of Piaget and Inhelder's (1963) experiments dealing with the coordination of perspectives has particular relevance to this study. In this case, Piaget and Inhelder conducted their investigations with a sample of 100 Swiss children about whom little else is known except that they ranged in age from 4 to 12 years.

The experiment consisted of three types of tasks involving a three dimensional model of three mountains which differed in size, shape and color. Three methods of questioning were employed. In the first method, a doll was placed at various positions around the model and the child was required to replicate the doll's perspective with three flat cardboard shapes similar to the mountains. The second method required the child to select one of ten pictures to best represent the doll's point of view. The third method was the converse of the second and involved presenting the child with a picture and asking him to indicate where the doll would have to be to "see" that perspective.

As a result of their investigations, the authors identified three stages of conceptual development. However, the ages at which these stages occur are not stated explicitly and must be extrapolated from the data. The following age-stage relationships were identified.

Stage I. (4-5 or 6 years). A child at this stage does not understand the questions and consequently cannot participate in the experiment.

Stage II. (6 to 7 or 8 years). Throughout this stage, the child has great difficulty distinguishing between his viewpoint and that of other observers.

At substage IIA, the child is bound by an egocentric illusion in which he fails to realize that any viewpoint other than his own is possible.

At substage IIB, the child shows some attempt at discrimination but lapses back into the egocentric constructions of substage IIA. However, Piaget and Inhelder identify substage IIB as the beginning of a transition between spatial egocentrism and an understanding of true relativity which appears later.

The child at stage II has not developed an understanding of before-behind or left-right relationships and therefore cannot master a task requiring a coordination of perspectives.

Stage III (7-8 to 11-12 years). The child at this stage evidences a progressive discrimination and coordination of perspectives. At substage IIIA (7-8 to 9 years), he has discovered the before-behind and left-right relationships but cannot combine these into a comprehensive coordination of perspectives. That is, the child can take one of these relationships into account, but cannot use both types simultaneously.

The final substage, IIIB (9-10 years) is characterized by the complete mastery of perspective in which the correspondence between the observer's position and the projective relationship

is understood by the child. The investigators found that the children at level IIIB found it easier to replicate the scene with the three carboard cut-outs than to choose the correct picture of the model. This is an interesting finding as it seems to support Piaget's theory that children learn best throught manipulative type actions.

Piaget and Inhelder explain their findings by hypothesizing that a system of projective relationships or perspective viewpoints consists of mental operations which assemble perceptual data and coordinate it in terms of reciprocal relationships. In addition, they state that the development of a perspective system is dependent upon acts of intelligence and is, therfore, conceptual rather than merely perceptual in character.

One of the few American studies dealing specifically with this topic was conducted by Miller (1967). This study involved 150 children from kindergarten to 6th grade. However, the test items concerned a three-dimensional fictitious island group rather than mountains and the questioning techniques also differed from those of Piaget and Inhelder. In general, Miller found a sequential pattern in the development of perceptual ability but his report does not attempt to compare his findings with those of Piaget and Inhelder.

Towler (1965) conducted a study with Canadian children in which he investigated the development of four spatial concepts in elementary school children. In addition, the relationship between these concepts and sex, socio-economic status, chronological age, I.Q. and grade level was also examined. The results of the study revealed a pattern of ontogenetic development similar to that described by Piaget and Inhelder but with discrepancies of several years in some instances.

Many studies of children's concept formation have investigated the effects of factors of intelligence and chronological age on the development of certain concepts and have found significant relationships. However, one factor which has been investigated with varying degrees of success is that of socio-economic status. Vinacke (1952) reported that this variable had a very low relationship to scores on concept tests. Since then, Lodwell (1963), Towler (1965) and Pedde (1966), while not finding a significant relationship, have conducted studies which have provided evidence to suggest that socio-economic status is a factor but that it has not been measured precisely enough.

In addition, Almy (1966) has found definite proof that children of lower socio-economic class families do not attain certain levels of concept development as quickly as do children of higher status families.

II. RATIONALE

One of the prime concerns of this study was to investigate the development of children's abilities to coordinate perspectives. As previously noted, Piaget and Inhelder's study is now 20 years old and generalizations to American children generally are still relatively untested. In addition, it was neither tightly controlled nor were any attempts made to rigorously analyze the data.

Three methodological problems in the Geneva study were:

1. Piaget and Inhelder used a model of three mountains which, one would assume would be familiar to the Swiss children involved in the study. However, if familiarity of the landscape is to be retained as a factor, then one ought not to present urban children with a less familiar rural or island landscape.

2. Piaget and Inhelder's first questioning technique required the children to reproduce certain perspectives with the aid of two dimensional cardboard cut-outs. However, Pedde (1966) found that young children have great difficulty in moving from a three dimensional model to a two-dimensional representation of it. Yet this was the requirement set by the Geneva investigators, and upon which they based much of their age-stage relationships.

Additional support for the inappropriateness of this technique may be derived from Bruner's (1966) theory concerning representative modes of thought. According to Bruner, there is a sequential development of children's representational abilities which involves three modes of representation: **enactive, ikonic and symbolic.** These modes are concerned with action, images and symbols respectively.

One may argue that this is merely an extension of Piaget's theory of mental development beginning with sensori-motor activity and ending with abstract, formal operations. However, there is reason to hypothesize that if children were given the opportunity to respond to Piaget's first questioning method by manipulation of three dimensional objects (enactive or sensori-motor activity), then their response might differ from those reported by Piaget and Inhelder.

3. As previously indicated, there was no attempt to determine the relationship between socio-economic status and the development of the ability to coordinate perspectives despite the evidence suggesting that this may be an important factor.

III. RESEARCH HYPOTHESES

The following hypotheses were proposed for this study.

1. There is a sequential pattern in the development of children's abilities to coordinate perspectives.

2. The use of an urban environment in the Test of Coordination of Perspectives will result in an earlier development of the age-stage relationships than found by Piaget and Inhelder.

The following hypotheses were tested statistically.

1. There is significant correlation between chronological age and the ability to coordinate perspectives.

2. There is a significant correlation between intelligence and the ability to coordinate perspectives.

3. There is a significant correlation between socio-economic status and the ability to coordinate perspectives.

4. There is a significant correlation between a knowledge of left-right relationships and the ability to coordinate perspectives.

5. There is a significant difference in the mean scores of the high and low socio-economic groups on the Test of Coordination of Perspectives when the effect of intelligence is removed.

6. There is a significant difference in the mean scores on the Test of Coordination of Perspectives for subjects living in urban as opposed to rural environments.

PS004803

CHAPTER II

THE EXPERIMENTAL DESIGN AND METHODOLOGICAL PROCEDURES

I. A DESCRIPTION OF THE PROCEDURES

The procedures followed in this study involved the administration of test of right-left relationships and a test of Coordination of Perspectives to a stratified random sample of elementary school subjects. Half of the subjects were selected from an urban area school and the other half from a rural area school. In addition, the schools were judged to be dissimilar in respect to the socioeconomic status of the subjects' parents. This factor was measured with Hollingshead's Twp-Factor Index of Social Position. Subjects' performance on the tests was examined for relationships to: age-stage patterns, differences due to social class, environment, age, and intelligence.

II. THE SAMPLE

A statified random sample was drawn from the elementary school populations of Tippecanoe County and West Lafayette, Indiana. The stratification criteria were:

1. English as the native language. Since the testing procedures were highly verbal, it was necessary to exclude subjects who might experience difficulty in this regard. The possibility of such difficulty was ascertained from school records and teacher conferences.

2. Defective vision. Since perceptual ability was a crucial factor, subjects whose school records show uncorrected visual disorders were excluded from the study.

3. Socio-economic status. This parameter was measured through an application of Hollingshead's Two-Factor Index of Social Position. This instrument ranks status on a five point scale according to occupation and education. Both of these factors were ascertained directly from the parents of the subjects. High socio-economic status was defined as including ranks I and II, while low socio-economic status included ranks IV and V.

On the basis of these criteria, one hundred fifty-two subjects were selected. Twelve of these subjects took part in the pilot study and the remaining one hundred and forty served as the sample in the major investigation. The composition of this latter group was as follows: ten subjects from each grade level, kindergarten to grade six inclusive, making a total of seventy subjects from each of the two schools. The age range of the total sample from 5.0 to 12.7 years, and the mean intelligence quotient was 110.4.

II. THE PILOT STUDY

Prior to the beginning of the major investigation, two subjects from each grade level took part in a pilot study for the purposes of refining the instruments and procedures. On the basis of the results of that study, minor revisions were made in the administration of the tests and in the wording of the test of right-left relationships. This test was similar to that used by Piaget (1928) and Elkind (1961), however, the pilot study revealed a number of ambiguities in the questions to be asked. Accordingly, certain items were revised, tested and the revised version was used in the present study. The original test and the revised form may be found in Appendix A.

IV. THE INSTRUMENTS

Each subject was involved in two separate testing situations. In the first session an intellegence test was administered. The test used was the Lorge-Thorndike Intelligence Test, form A, non-verbal. In the second session, each subject was tested in individually with an instrument designed to assess the subjects' knowledge of left and right relationships and a Test of Coordination of Perspectives.

The Test of Coordination of Perspectives (TCP) was designed by the investigator following a pattern established by Piaget. The TCP consisted of three subtests and a total of 13 items. A description of the subtests is given below.

Subtest I

This subtest was designed to measure the subject's ability to replicate certain perspectives by reconstructing them on a model. The testing materials consisted of two, three-dimensional models of an urban environment of buildings and streets on circular bases and a doll in the shape of a man. The circular bases were 36 inches in diameter and the buildings were plastic models in the scale of "HO" model railroads. Three types of buildings were used: a house, a church and a bakery. In addition, two trees were placed in one of the quadrants formed by the intersection of the roads. The placement of the buildings and trees is shown in Figure 1.

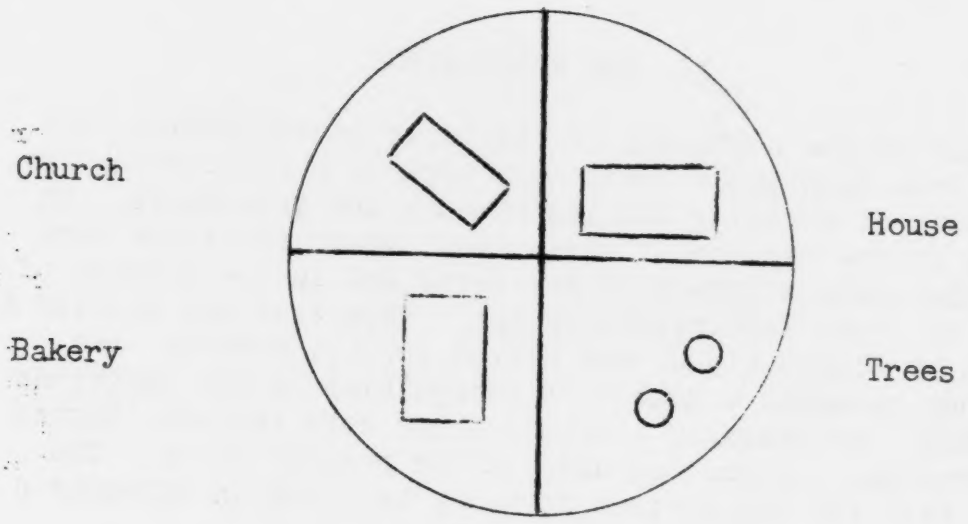


FIGURE I.
ONE OF THE MODELS USED IN THE TEST OF COORDINATION OF PERSPECTIVES.

The rationale behind this subtest was that since Piaget had presented a familiar landscape to his subjects, the same procedure ought to be followed in this study. Hence, for the urban subjects, the model represented the type of environment which would be familiar to them. The inclusion of rural subjects in the sample provided an opportunity to assess whether familiarity of the landscape might affect performance on the test.

In addition, Piaget's experiment required the subject to reconstruct a perspective of the model using two-dimensional cardboard figures. This meant that the child had to move from a three-dimensional to a two-dimensional representation. However, Pedde (1966) has shown that children at an early age find it very difficult to perform this task. Hence it was hypothesized that by having the subjects perform within the framework of a three-dimensional task would result in more accurate assessment of their ability to perform the requisite mental operations.

In every case, the subject was shown the two models and then asked to stand at position one as shown in Figure 2. Model A had no buildings on it, while the landscape was complete on model B. The doll was placed on model B at position one and the subject was asked to place his eyes at the doll's height and to study the model carefully. At this point, it was explained that the subject was to look at what the doll saw since he was going to be asked to build an exact copy on the other base (model A) using similar trees and buildings.

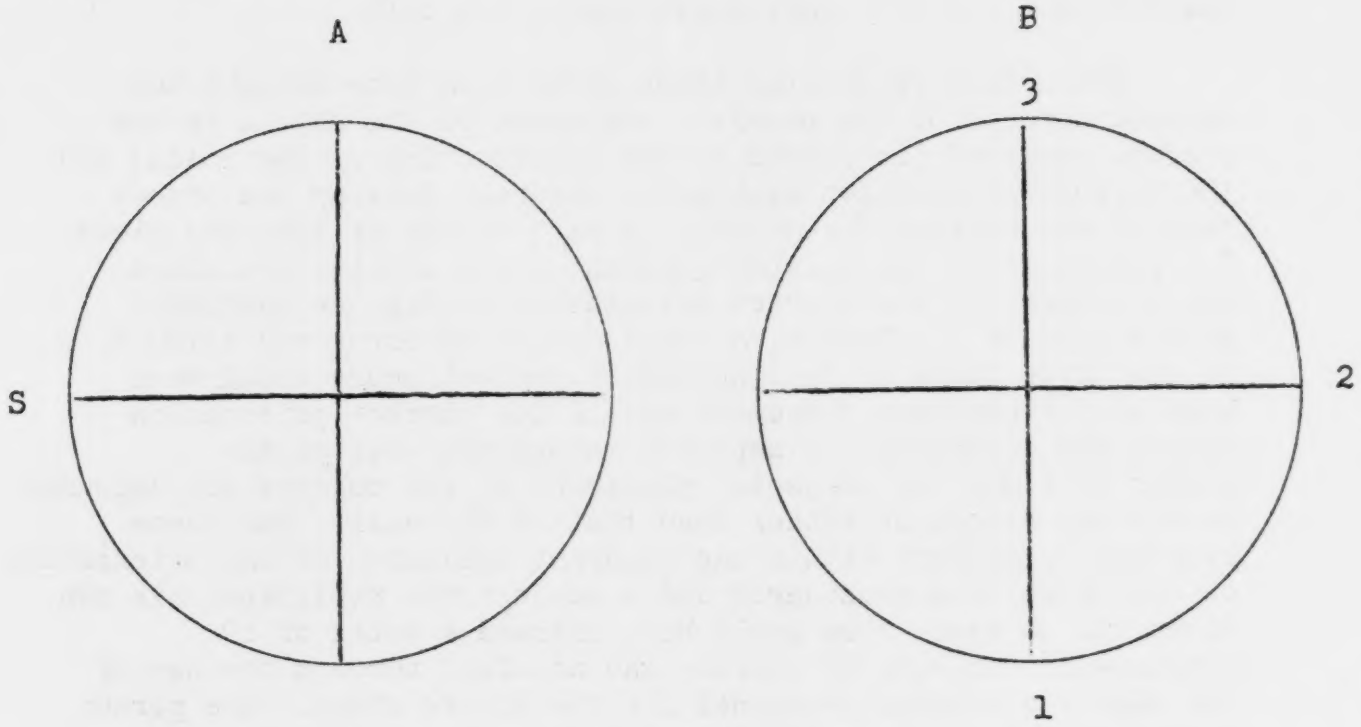


FIGURE 2.

THE ORIENTATION OF THE TCP MODELS

A standard set of instructions were repeated for each subject, however, due to the age range and the clinical nature of the testing situation, minor variations in the instructions were employed in an attempt to insure that each subject understood exactly what was being required. After the examiner was satisfied that the subject knew what was required of him, the latter was asked to step to position S (as shown in Figure 2) and to reconstruct the village exactly as the doll had seen it. The examiner handed the subjects the trees and buildings in a set order of: bakery, church, house and the two trees (which for ease of handling were fastened to a piece of cardboard).

The subject was allowed to go back to the model B as often as he wished to check his placement of the buildings and trees. After the subject had completed the item to his satisfaction, he was asked how he knew where to place the objects. A similar procedure was followed for two other positions of the doll.

The method of scoring these items took into account two related aspects of the problem: placement of the object in the correct quadrant (as formed by the intersection of the roads) and the correct orientation within the quadrant (having the object face in the correct direction). A mark of one or zero was given for placement in the correct quadrant and a similar procedure was followed for the correct orientation within the quadrant. In the case of the latter, a small margin of error was allowed. On the three items of this subtest a perfect score would have been 12 for quadrant placement and 12 for correct orientation within the quadrants. A separate record was kept of the number of times the subjects' placement of the objects corresponded to his own viewpoint rather than that of the doll. For these purposes, placement within the quadrant exclusive of the orientation of the object was considered and a subject who replicated his own viewpoint on every item would have amassed a total of 12. Consistency and ease of scoring was attained through the use of the same two testing personnel for the entire study. One person served as the examiner and directed the subject in every item, while the second person recorded the subject's score on specially prepared score sheets (see Appendix B) and tape recorded the subject's verbal reactions to the questions pertaining to how he knew where to place the models. In addition, the testing team recorded their observations of the subject's performance during the test.

Subtest II

This subtest contained five items and was patterned after a test used by Piaget. The apparatus for this subtest consisted of one of the model villages complete with buildings as used in Subtest I, and a set of eight, 8 by 10 inch colored photographs of different perspectives of the model. These perspectives were photographed at the doll's "eye level" by placing the camera $2\frac{1}{2}$ inches above the base of the model. The camera positions for the eight views are shown in Figure 3, however, the five items of the test required a selection of views 3,5,7,8 and 4 in that order. All eight photographs were mounted on a large board in a two by four matrix in numerical order.

PICTURES

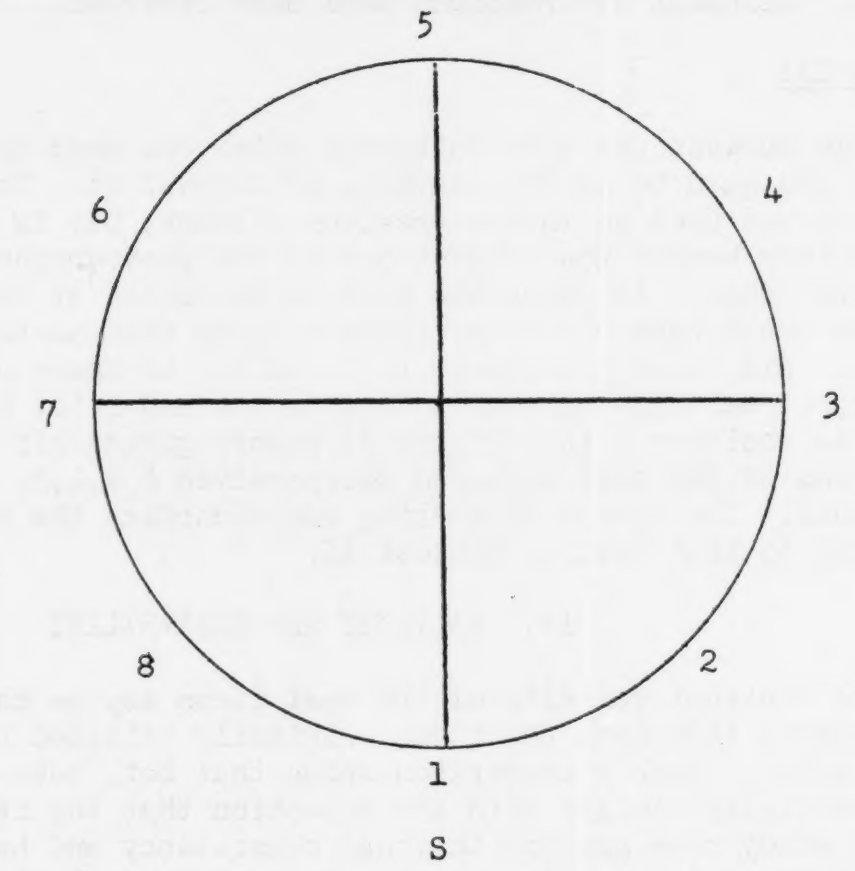


FIGURE 3.

THE PHYSICAL SETTING FOR SUBTEST II

Each item required that the subject stand in front of a complete model village (see Figure 3) at the back of which was a board containing the eight colored photographs of different perspectives of the model. The examiner placed the man on the model and the subject was asked to imagine that the man had a camera and was taking a picture. Then the subject was asked to select from among the eight on the board, the picture that the man would have taken. Here again, the subject was encouraged to put his face at the "eye level" of the man, and was allowed to move around the model in order to do so. In every case, however, the subject was required to stand at position S (see Figure 3) when he chose the photograph. After he had made his selection, the subject was asked how he knew that his choice was the correct one.

Subjects received a mark of one for a correct choice and zero for incorrect choices. A record was kept of the subject's responses and a taped record was made by the examiners of the subject's answer to the question of how he knew which picture was correct. Clinical observations were also recorded.

Subtest III

This subtest was also patterned after one used by Piaget and was designed to be the converse of Subtest II. The same apparatus was used as in the previous subtest, but in this case, the examiner handed the subject one of the photographs and asked the subject to place the doll on the model at the position where he would have had to be to have taken that particular picture. All other procedures were similar to those of Subtest II, the subject was allowed to move around the model but had to return to position S (see Figure 3) before giving his reply. The five items of the test employed perspectives 6,2,4,5, and 7 in that order. The method of scoring and recording the responses was identical to that used in Subtest II.

IV. VALIDITY AND RELIABILITY

The contruct validity of the test items may be established by comparing them with the items originally utilized by Piaget and Inhelder. Such a comparison shows that both sets of items are essentially similar with the exception that the items used in this study have greater internal consistency and have been d designed to employ a more concrete form of manipulation. Similarly, these items are related to those of Miller with the added refinement of an urban setting for urban children. Furthermore, an intercorrelation analysis of each item in the TCP revealed a positive correlation for every item beyond the .01 level of significance.

V. THE STATISTICAL ANALYSES

Pearson product moment correlations were computed for the subjects' scores on the Test of Coordination of Perspectives and the variables of chronological age, intelligence and performance on the test of left-right relationships. A point biserial correlation was used to determine the relationship between socio-economic status and the Test of Coordination of Perspectives. A comparison of the scores of high and low socio-economic status groups on the Test of Coordination of Perspectives with the effect of intelligence removed was achieved through an application of an analysis of covariance. A t test was used to determine the significance of difference between the mean scores of urban versus rural groups on the Test of Coordination of Perspectives.

CHAPTER III

RESULTS AND ANALYSES

I. THE RESULTS OF THE TEST OF RIGHT-LEFT RELATIONSHIPS

The revised form of the test of right-left relationships (see Appendix A) was administered to every subject individually. According to the scoring procedures used by Piaget and Elkind, the test results in a hierarchical grading of a subject's ability to understand the relationships between left and right. However, this procedure requires that the levels be determined on the basis of an errorless progression through the items. That is, any error by a subject automatically precludes his advancing to a higher level. Yet, in the administration of the instrument to this sample, it was noticed that subjects frequently missed some items or even entire levels of items and were still able to progress to "higher" levels and to answer them correctly. Accordingly, each subject was scored first on the basis of the rules established by Piaget, and secondly by allowing him to progress to the end of the instrument at which point the total of the correctly answered items was scored. These results are shown in Table I.

An analysis of these results indicated a general trend for the scores to increase with grade level and for the subjects from School A (urban, higher SES) to score more highly than subjects from School B (rural, lower SES) after the second grade. It is interesting to note that in both groups of subjects the highest scores in terms of right-left levels occured at the fifth grade.

TABLE I

MEAN SCORES ON THE TEST OF RIGHT-LEFT RELATIONSHIPS

	School A		School B	
Grade	Level	Total	Level	Total
K	.9	11.6	1.1	10.7
1	1.1	11.8	1.3	12.2
2	4.1	18.2	2.5	15.7
3	3.8	19.1	2.4	11.5
4	3.9	19.5	2.9	17.8
5	5.5	21.6	4.8	19.4
6	5.3	20.5	4.4	21.5

Note: highest level attainable = 6.0
highest total attainable = 22.0
N = 10 per grade per school

II. THE RESULTS OF TEST OF COORDINATION OF PERSPECTIVES

Subtest I

This subtest required the subject to reconstruct a given perspective with the use of models. The results of the subtest are given in Table II which shows the mean scores in terms of the subjects' placement of the models in the correct quadrant, in the correct orientation within the quadrant and finally the mean number of egocentric placements.

An analysis of these data indicated a general trend for improvement in the scores with an increase in the grade level, and conversely, a decrease in the degree of egocentrism as evidenced by constructing the models according to the subject's own viewpoint. Similarly, the subject's ability to place the models in the correct orientation within the quadrants also improved with grade level. However, these are only general trends and a number of discrepencies should be noted. For example, the increase in performance ability was not always orderly and some grade levels seemed to be more adept than others. In most instances though, individual differences appeared to be slight.

In terms of a comparison with Piaget's findings, the scores of this sample indicated that some young children are not as egocentric as Piaget suggests. According to the latter, children within the approximate age range of 4 to 7 years are either unable to participate in the study due to a lack of comprehension, or they give predominatly egocentric responses. Such was not the case in this study since children as young as 5 years 0 months were able to respond to the instruments in every case. With regards to their egocentrism however, the results are less clear. The subjects from School A (higher socio-economic status, urban) gave relatively few egocentric responses (as shown in Table II) while in School B (lower socio-economic status, rural) a much greater number of egocentric responses was noted at each grade level with the second grade subjects giving practically nothing but this type of response. Hence, Piaget's claim that the young child is extremely egocentric does not hold for the sample as a whole, yet it is obviously more applicable for the subjects in School B as opposed to those in School A. The possible reasons for these findings are discussed later in this chapter.

TABLE II

MEAN SCORES ON SUBTEST I, TCP

	School A			School B		
Grade	Quadrant	Orientation	Own view	Quadrant	Orientation	Ownview
K	.8	.7	.7	1.7	.5	6.0
1	3.8	2.0	3.9	.2	.0	11.0
2	9.2	5.7	.7	4.4	1.0	5.9
3	10.2	7.5	.2	7.4	4.5	4.5
4	10.0	7.7	.9	4.9	4.2	6.3
5	11.4	9.0	.0	10.6	9.5	1.7
6	10.6	8.4	.7	11.0	9.9	.6

Note: highest scores attainable = 12.0
N = 10 per grade per school

Subtest II.

In this subtest, the examiner placed a "man" on the model village and then asked the subject to choose which of eight photographs could have been taken from that perspective. The mean scores for the subjects are given in Table III.

An analysis of these results indicated that the previously noted general trend for improvement with grade level was in effect in this test with a corresponding decrease in the number of egocentric responses. Here again, the subjects from School A appeared to be more adept at the tasks than did the subjects from School B. In addition, there were fewer egocentric responses from the former compared with those of the latter.

TABLE III

MEAN SCORES ON SUBTEST II, TCP

	School A		School B	
Grade	Score	Own Viewpoint	Score	Own Viewpoint
K	.8	.7	1.0	.8
1	2.0	.4	1.4	.9
2	2.3	.4	1.8	.6
3	3.9	.2	2.2	.4
4	3.8	.0	1.6	1.0
5	3.6	.0	4.5	.2
6	4.2	.1	3.2	.6

Note: N = 10 per grade per school
Total score on viewpoints attainable = 5.0

Subtest III.

This subtest was the converse of subtest II in that the procedures were reversed and the examiner showed the subject a photograph of the model and asked him to place the "man" on the model at the position where he could take such a picture. The results for this subtest are summarized in Table IV.

An examination of the data revealed a general trend for improvement with grade level and a corresponding decrease in egocentric views. As in the previous cases, subjects from School A performed at a higher level and with fewer cases of egocentrism than the subjects from School B. This subtest appeared to be the least difficult for all subjects in terms of their number of egocentric responses.

TABLE IV

MEAN SCORES ON SUBTEST III, TCP

Grade	School A		School B	
	Score	Own Viewpoint	Score	Own Viewpoint
K	.7	.5	.5	.4
1	1.3	.5	.6	.7
2	2.9	.1	2.0	.3
3	2.9	.2	2.7	.5
4	4.0	.0	3.1	.1
5	4.0	.0	3.5	.0
6	4.0	.0	3.6	.0

Note: N = 10 per grade per school
Highest score on viewpoints attainable = 5.0

Total Scores on the TCP

The scores on each of the three subtests were totaled in order to give a combined score on the entire TCP. In doing so, it should be noted that only the scores on subtest I pertaining to placement within the correct quadrant were summed with the other subtest. This procedure was similar to the scoring methods established by Piaget. The combined results of the subtest is given in Table V.

These data reinforced the observation that a general trend was in operation with regard to increased performance with grade level. Once again, subjects from School A seemed to achieve better scores on the test as a whole than did subjects of School B.

TABLE V

COMBINED MEAN SCORES OF THE SUBTESTS IN THE TCP

Grade	School A	School B
K	2.3	3.2
1	7.1	2.2
2	14.4	8.2
3	17.0	12.3
4	17.8	9.6
5	19.0	18.6
6	18.8	17.8

Note: N = 10 per grade per school
Total score attainable = 22.0

Intercorrelations of the Subtest in the TCP

In an attempt to determine the internal consistency of the three subtest comprising the Test of Coordination of Perspectives, the intercorrelations of the scores on the subtests and the entire TCP were calculated. These results are given in Table VI, which shows that each of the subtests were highly correlated with each other and the combined total score.

TABLE VI

INTERCORRELATIONS OF THE SUBTESTS AND COMBINED TCP SCORES

Subtest	I	II	III	Total TCP
I	1.000	.4453*	.4284*	.8062*
II		1.000	.6525*	.4808*
III			1.000	.4429*
Total TCP				1.000

*Significant at the .01 level (r = .254)

III. THE STATISTICAL ANALYSES OF THE DATA

The statistical analyses of the results of the study in terms of the six research hypotheses and teh statistical procedures employed are described below.

Hypothesis 1.

There is a significant correlation between chronological age and the ability to coordinate persepctives. This hypothesis was tested by determining the Pearson Product Moment correlation between each subject's chronological age and his combined score on the TCP. Results indicated that there was a positive correlation significant at the .01 level, hence this hypothesis was accepted. ($r = .490$, $p \leq .01$) A similar procedure for each of the three subtests in the TCP resulted in significant correlations at the .01 level of confidence in each case.

Hypothesis 2.

There is a significant correlation between intelligence and the ability to coordinate perspectives. This hypothesis was also tested using Pearson Product Moment correlation. This yielded a positive correlation significant at the .01 level, consequently, this hypothesis was accepted. ($r = .330$, $p \leq .01$) Here again similar highly significant (.01) correlations were found for this factor and each of the three subtests in the TCP.

Hypothesis 3.

There is a significant correlation between socio-economic status and the ability to coordinate perspectives. This hypothesis was tested by computing the point biserial correlation for the subjects' scores on the TCP and their level of socio-economic status as measured by the Hoolingshead instrument. The results indicated that there was a positive correlation, significant at the .01 level of confidence ($r = .421$, $p = .01$). Hence, this hypothesis was accepted. Any interpretation of this result ought to be made taking the results of hypothesis 5 into consideration.

Hypothesis 4.

There is a significant correlation between a knowledge of left-right relationships and the ability to coordinate perspectives. This hypothesis was tested by computing a Pearson Product Moment correlation between each subject's score on the test of right-left relationships and his combined score on the TCP. The analysis showed that there was a positive correlation, significant at the .01 level. ($r = .359$, $p \leq .01$). Hence, this hypothesis was accepted.

Hypothesis 5.

There is a significant difference in the mean scores of the high and low socio-economic status groups on the TCP when the effect of intelligence is removed. In testing this hypothesis, subjects falling in the middle category of Hollingshead's two factor index of social position were rejected. This left a total of 128 subjects evenly divided into high and low groups. The mean intelligence scores for the groups were 115.28 for the high and 104.58 for the low. This represented a mean difference of 10.7 points as measured by the Lorge-Thorndike instrument. This difference was found to be highly significant at the .01 level of confidence ($t = 5.13$). The statistical analysis employed was an application of a one way analysis of covariance. However, since it was not logical to compare the scores of the primary grade subjects with those of the upper grades, the sample was split into three groups. In group 1 the combined TCP scores of the high and low subjects in grades K, 1 and 2 were compared ($N = 58$, equally divided high and low). The second group consisted of the subjects in grades 3 and 4 ($N = 34$, equally divided high and low). The third group contained the high and low subjects in grades 5 and 6 ($N = 36$, equally divided). The resultant analyses failed to indicate any significant differences between the groups at the .05 level of confidence. Hence this hypothesis was rejected. The analysis was also carried out for each of the three subtests comprising the TCP with a similar lack of significant differences.

Hypothesis 6.

There is a significant difference in the mean scores on the TCP for subjects living in urban as opposed to rural environments. This hypothesis was tested through an application of a t test to the mean scores of the subjects on the combined TCP. School A was situated in an urban environment of approximately 65,000 people, hence the subjects from this school were classified as living in an urban setting. School B was situated 25 miles from the nearest large community (that of School A) in a predominately rural environment in which the total school population was bussed to the school. These subjects were classified as living in a rural setting. In the application of the t test, the mean scores of the subjects from School A were compared to those from School B. The results of the analysis indicated that there was a difference at the .01 level of confidence ($t = 2.53$) between the scores of the two samples on the combined TCP and each of its subtests. However, as it happened, all of the subjects classified as low socio-economic status came from School B (rural) and all but two of the subjects classified as high socio-economic status came from School A (urban). Hence, a comparison status came from School A (urban).

Hence, a comparison of the high and low socio-economic status groups was in essence a comparison of the urban vs rural groups and while there was a difference in the performance of these two groups, it was not found to be significant when the effect of intelligence was taken into consideration through an application of a one way analysis of variance (as explained with reference to hypothesis five). Consequently, this hypothesis was rejected.

IV. CLINICAL OBSERVATIONS BASED ON THE TESTING SITUATION

Since the method employed in the testing situation was an adaption of Piaget's "clinical" method of observation and interview, each testing experience was tape recorded and analysed later in an attempt to isolate those factors which were pertient to the child's acquisition of the concepts under investigation.

The Test of Right-Left Relationships

As might be expected, the administration of this instrument becamse easier with an increase in the age/grade level of the subject. However, it was felt that the test was not a very refined instrument and that while it did render some gross measure of a subject's knowledge of left-right relationships, there was reason to believe that the hierarchy of items did not pertain to all children at all times. For example, many subjects "failed" one level of the test, but could progress to a more "difficult" level and answer it correctly. In addition, it was noted that many subjects responded to the questions in levels 2, 3 and 5 (in which the subject sat facing the examiner) so as to give correct responses from the examiner's point of view.

Despite these limitations, the instrument did measure a factor which was involved in the ability to perform on the TCP since the correlation of the scores with the subjects' scores on the TCP were .360 for the levels and .648 for the total score on the right-left test. In both cases, the correlations were highly significant, ($r \leq .254$ required for significance at the .01 level of confidence).

The Test of Coordination of Perspectives

In keeping with the Piagetian method of clinical observation, while at the same time attempting to be more rigorous in the collection of data, the following procedure was adopted during the testing as described in Chapter II, however, after the responses had been scored and recorded, the examiners experimented with giving those subjects who failed the item(s) a variety of clues to the problem at hand. Usually this was done only for the items in

Subtest I (the construction of the model village). The techniques employed were combinations of the following:

a) When a subject had completed the reconstruction to his satisfaction, E asked him to compare the models to see if E pointed to a building and asked whether it was placed in the correct position.

b) If S still failed to see that he had made an error, E asked him to return to model B and to place his hadn over one of the buildings. S was then told to go back to the model he had just built and to see if that building was still under his hand.

c) In some cases, E simply made the necessary correction on S's model and asked if that change was acceptable.

The following observations were noted.

When solving the problem presented by the items in the first subtest, the subjects' responses fell into the following pattern. In Stage I, the subjects did not seem able to build the model according to the "man's" perspective and either placed the buildings at random or in an egocentric manner, however, there were few, if any cases, in which the examiners felt that the subject did not understand the requirements of the task. This stage was most apparent with the youngest subjects or the kindergarten group. Even when the clinical questions were put to these subjects, they generally refused to admit that there were errors in their placement of the buildings.

The characteristic behavior observed in Stage II involved two substages. In Stage IIA, the subject generally gave correct responses to item 1, but could not do the same for the other two items in the subtest. When asked why he had placed the buildings correctly the first time, the usual response was vague and to the effect that he had just looked at it and remembered it. It would seem that subjects at this stage memorized the relationships for the first item, but became confused when confronted with a repetition of the task from a variety of perspectives. This type of behavior is similar to that described by Piaget in connection with the conservation of area. In the case of the latter, subjects initially give correct responses until the number of items in the test is increased, at which point, the subject returns to non-conservation answers.

At Stage IIB, the subjects grasped the problem immediately and gave some verbal indication of their awareness of the problems of keeping left-right or before-behind relationships in mind. However, none of them were able to orient the objects accurately according to even one set of relations and none were capable of combining both sets simultaneously. At the same time, some of the most consistently egocentric responses were noted with these subjects.

Subjects at this stage of development gave very interesting responses when asked the extra, "clinical" questions. Nearly all subjects were able to recognize that their model was not correct without being told so but they did not know why. When asked to use their hands in checking their accuracy, subjects usually either failed to see what was wrong, or they tried to justify their placement of the buildings. That is, if the church should have been under the subject's right hand on the original, but was on his left on his model, he simply switched hands and holding his left over his church, claimed that it was correct. This second stage of development was most noticeable in grades one and two.

It would seem that subjects in this stage of development were usually able to see that they had not copied the model correctly but did not understand what exactly was wrong in their reconstruction. In other words, they were no longer bound by egocentrism, but they had not fully developed a functional understanding of before-behind, left-right relationships. Hence, when confronted with this 'insoluble' problem, they simply lasped back to a completely egocentic type of response.

The third stage of development was also marked by two levels of behavior. In substage IIIA, the subjects had a much better knowledge of the right-left, before-behind relationships, they could still not combine them correctly. Consequently, many subjects completed their model explaining that they did so by looking at what was on the left or right or by taking into account what was nearest or farthest away. Despite this awareness of what was needed to place the buildings accurately, the results were that the subjects made correct placements in either two of the left and right quadrants or in two of the front and back quadrants, but not both. However, when asked the "clinical" questions, the subjects usually saw their errors and corrected them easily. This substage was most apparent at the third and fourth grades.

Substage IIIB was characterized by the final attainment of the ability to coordinate the perspectives immediately. The final substage appeared at the fifth and sixth grades.

The analyses of the data and the observations of the examiners also led to the conclusion that the subjects did not begin to begin to become aware of the need to orient the buildings correctly in the first subtest until about the second or third grade level, after which their proficiency in doing so increased with their ability to coordinate the perspectives.

A similar progression in the ability to coordinate the perspectives in subtest II and III of the TCP was also noted, as well as the general tendency to find that subtest III was the most difficult of these two tests and that it resulted in lower scores and a greater number of egocentric viewpoints on the part of the subjects.

A Comparision of the Stages of Development with Piaget's.

In general, the results of this study indicated that the stages in the development of the ability to coordinate perspectives is very similar to the sequence of stages reported by Piaget. However, one or two important discrepancies were apparent. First, Piaget claims that children in the 4 to 5 or 6 year age range are not capable of understanding the questions and cannot participate in the study. This was certainly not the case with this sample. The youngest subject tested was 5.0 years, but there was no evidence which suggested that this subject or any other in the 5 to 6 age range did not understand what was required. In fact, there were isolated cases of five year olds who performed with almost complete accuracy on the tests.

The second discrepancy concerns a comparision of the ages at which the stages occured. Piaget's age-stage limitations appeared to apply to the sample of subjects from School B, however, the subjects in School A reached each level of development approximately one year earlier than either the subjects from School B or the sample upon which Piaget based his original estimates. The reason behind this difference between the samples in this study could be accounted for by a number of factors: age, intelligence, socio-economic status or the home environment of the subjects. Looking at each of these, we find that the age ranges and differences within grade levels for the subjects in the two schools is not significantly different (5.6 to 12.6 School A, 5.0 to 12.11 School B), hence this factor does not likely apply.

While the theory that socio-economic status or environment seems plausable, such was not the case when the effects of intelligence were considered. Hence, it would appear that the reason why the subjects in one school were more advanced can be attributed to their higher intelligence. However, while this conclusion is statistically correct, there remains the suspicion that the solution is not as clear-cut as it appears. Is the increase in ability due solely to intelligence, or are there also socio-economic status and environmental factors at work as well? Or, to put it another way, why was it that the children from the higher socio-economic status homes and/or the urban area were more intelligent as measured by the Lorge-Thorndike instrument and capable of better performance on the TCP? These questions are explored in the following chapter.

CHAPTER IV

CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

I. DISCUSSION OF THE FINDINGS.

The Hypotheses

The results of the study in terms of the hypotheses were as follows:

Hypothesis 1. There is a significant correlation between chronological age and the ability to coordinate perspectives. This hypothesis was accepted for each subtest of the TCP and the total TCP score.

Hypothesis 2. There is a significant correlation between intelligence and the ability to coordinate perspectives. This hypothesis was also accepted for each of the subtests and the total TCP score.

Hypothesis 3. There is a significant correlation between socio-economic status and the ability to coordinate perspectives. Statistically, there was a significant correlation (.01 level) and the hypothesis was accepted, however when viewed together with the results of hypothesis 5, which found that differences between high and low socio-economic groups disappeared when the effects of intelligence was considered, the validity of this hypothesis must be reassessed. Nevertheless, there is reason to believe that socio-economic status factors and/or the subjects environments did have an effect on their ability to perform on the TCP.

Hypothesis 4. There is a significant correlation between a knowledge of left-right relationships and the ability to coordinate perspectives. This hypothesis was accepted. In addition, it was apparent from the observations of the examiners and from Piaget's theory, that the subjects' awareness of and facility in applying before-behind relationships to TCP task items also led to an increase in ability to coordinate perspectives.

Hypothesis 5. There is a significant difference in the mean scores of high and low socio-economic status groups on the TCP when the effect of intelligence is removed. This hypothesis was rejected. It is at this point, however, that a number of factors are called into question, namely the relationships among socio-economic status, intelligence, urban or rural environments and the ability to coordinate perspectives. It would seem from these results, that the difference in the performance of the

subjects at the two schools could be attributed to the effects of intelligence, however, in the one grade level when the IQ scores were most similar, (grade one, means of 101.8 in School A, 102.1 School B) the differences between the subjects' scores still appears. A comparison of the subjects' mean scores on the first TCP subtest reveals these differences:

	School A	School B
Quadrant placement	3.8	.2
Correct orientation	2.0	.0
Egocentric placements	3.9	11.0

These results are not attributable to intelligence alone, but there is no way to determine which if either of the other factors mentioned above, is responsible. It does, nevertheless, tend to support the investigators suspicion that these factors do have an effect on the acquisition of the concepts under investigation.

Even if one wished to dismiss the data from the first grade subjects as isolated and irrelevant, there is still the problem of why the subjects from the urban, higher socio-economic status area performed at a higher level on the intelligence tests and the TCP. That is, what are the common elements being measured by these instruments and what is it in the environment of these children which permits them to achieve higher scores on these two tests?

Hypothesis 6. There is a significant difference in the mean scores on the TCP for subjects living in urban as opposed to rural environments. This hypothesis was also rejected, since while a difference did appear, it was nullified when the effect of intelligence was taken into consideration.

The Working Hypothesis. Two other hypothesis were proposed in this study. The first hypothesis stated that there would be a sequential pattern in the development of children's abilities to coordinate perspectives. This hypothesis was accepted since a pattern of stages was established for the sample as a whole. The second hypothesis stated that the use of an urban environment in the TCP instrument would result in an earlier development of the age-stage relationships than found by Piaget. This hypothesis was rejected, but with reservations since while there was an earlier development in the case of the urban sample, it may have been completely attributable to their higher intelligence.

The Age-Stage Relationships

In comparing the age-stage relationships found in this sample with those reported by Piaget, the following points were noted:

The developmental sequence initially identified by Piaget seems to apply to this sample. That is, there are three separate stages in the pattern of development and each one is characterized by a distinctive type of response ranging from egocentricism to an awareness of left-right or before-behind relationships, then the ability to coordinate these relations and finally the correct coordination of perspectives. A more detailed description of these stages was given in Chapter III.

With regard to the ages at which these stages appear, however, the results of this study differ from Piaget's in several aspects. First, Piaget claims that children within the age range of 4 to 5 or 6 years cannot participate in the experiment due to their inability to understand the questions and to respond to the test. This was not the case with this sample. Children as young as 5.0 years were tested and found to be not only capable of understanding the questions and performing on the tests, but in some cases, even the youngest achieved a surprising degree of accuracy. Thus it would appear that either the experimental materials and procedures used in this study are more readily understood than Piaget's or that young children in this sample are more advanced than those in Piaget's sample. Since the tests were designed after those used by Piaget and may be considered to be replicates of his, the first explanation does not seem applicable, particularly since some of the youngest subjects not only understood the tests, but performed well on them.

The second discrepancy concerns the ages at which the stages of development occured for this sample. As has already been pointed out, the subjects from School B progressed through the same stages and at the same ages as Piaget reports, while the subjects from School A appeared to have developed these stages approximately one year earlier. This difference in development may be caused by the difference in the intelligence scores of the two groups of subjects, however, it should be noted that the mean IQs of both groups fall within the normal range as measured by the Lorge-Thorndike instrument. The Lorge-Thorndike test renders a norm of 100 and a standard deviation of 16.

The mean IQ for the high SES group was 115.28 and the low SES group had a mean IQ of 104.58. Consequently, it may be stated that within a normal IQ range, some children are as much as one year in advance of Piaget's age-stage relationships.

Knowledge of Left-Right Relationships.

While the investigator has some reservations concerning the validity and relaibility of the instrument used to asses this factor, it is readily apparent that it was a key element in the development of the ability to coordinate perspectives. In addition, it would seem that children do not develop a very high ability to use left-right relationships until the fourth or fifth grade and that this is closely linked to intelligence and chronological age.

II. IMPLICATIONS

Psychological Aspects

It would appear from these results that children are not as egocentric as Piaget found with his study several years ago. Not only are young children more capable of attempting to coordinate perspectives than he suggests, but even the youngest subjects do not give completely egocentric responses. This data agrees with that of Shantz and Watson (1967) who found that contrary to Piaget's findings, some very young children do have gross expectations concerning the relationships between objects and their orientations. However, it is apparent that children do have imperfect conceptions regarding perspectives other than their own and that the ability to coordinate perspectives accurately does not appear until the age of ten or eleven.

It seems clear that the development of the ability to coordinate perspectives is dependent upon growth in intellectual ability and chronological age. In addition, there is reason to believe that there is a possibility that such factors as socio-economic status and environment may have an effect on this ability. In any event, progression from egocentrism to an accurate coordination of perspectives does follow a sequential pattern which requires a series of mental operations to enable the child to take several sets of relationships into consideration simultaneously and to utilize these relations as an operating system of references.

The finding that there are differences in the developmental stages of children of the same age but with different IQs (within the normal range) indicates that

Piaget's age-stage relationships may not be as closely lined to maturation and experience as he suggest, but may be more a function of intelligence.

Educational Aspects.

There are several implications for this study as it pertains to the education of children.

1. The fact that children are less egocentric than has been suggested by Piaget several years ago, ought to encourage educators to take advantage of childrens' mental development and state of readiness in encouraging them to develop more accurate concepts of the world about them.
2. Since the questions employed in the "clinical" aspect of the experiment tended to help some children perform more accurately on the test instruments, this suggests that children at various levels of development of the ability to coordinate perspectives may be helped in their acquisiton of these concepts through appropriate teaching techniques. In other words, it seems likely that it would be possible to accelerate the development of these abilities with children at certain levels of development.
3. The child's ability to coordinate perspectives is involved in a number of school subjects such as: mathematics and geometry in which he is required to visualize certain shapes and work with coordinates; or social studies where the child's performance on map and globe skills is dependent upon his being able to form accurate concepts and perceptions of the spatial configurations presented to him through geographic aids. Accordingly, if the relationship between these and other schools learning situations and the development of the ability to coordinate perspectives can be determined with more precision, this information could contribute significantly to our knowledge of how and when to teach these subjects most evficiently.
4. The decrease of egocentrism in the child is an important step in his intellectual development. As Piaget states,

> The important point it that...the child... begins to be liberated from his social and intellectual egocentrism and becomes capable of new coordinations which will be of the utmost importance in the development of intelligence and affectivity. With respect to intelligence, we are now dealing with the beginnings of the construction of logic itself. ...With respect to affectivity, the same system of social and individual coordination engenders a morality of

> cooperation and personal autonomy in contrast to the intuitive heteronomous morality of the small child. (1967, p. 41)

Hence, a more adequate understanding of how a child moves from egocentrism to relational coordination may enable teachers to further the intellectural and affective development of the child.

5. Egocentrism is also associated with socialization processes. As Neale (1966) suggest, since egocentrism represents an inability to see the world from the viewpoint of others, it may be that egocentrism is inversely related to socialization. Consequently a better understanding of the factors involved in moving a person to a less egocentric point of view could have important implications in helping a person understand other peoples' viewpoints and behavior. In other words, unless we can help a child conceptualize both sides of a given problem, we cannot hope to help him achieve any depth of understanding about the problem.

III. SUGGESTIONS FOR FURTHER RESEARCH

This study has given rise to a number of questions which might profitably be explored by other researchers. Some of these questions are presented below.

1. Can children at the age of four or below coordinate perspectives or are they as egocentrically bound as Piaget claims?
2. Are there training or teaching techniques which could be employed to enable children to become less egocentric at an earlier age?
3. Is there any relationship between the ability to coordinate perspectives and the factors of environment of socio-economic status?
4. What are the common elements in the Test of Coordination of Perspectives and the Lorge-Thorndike Intelligence Test?
5. What is the exact nature of the relationship between egocentrism or the ability to coordinate perspectives and school subjects such as geography, geometry, etc.?

Almy, M., et. al. Young Children's Thinking. New York: Teachers College Press, 1966.

Bruner, J. S., et. al. Studies in Cognitive Growth. New York: John Wiley and Sons, 1966.

Dodwell, P. C. "Children's Understandings of Spatial Concepts", Canadian Journal of Psychology, XVII, January, 1963. pp. 141-161.

Elkind, David. "Children's Conceptions of Right and Left: Piaget Replication Study IV", Journal of Genetic Psychology, 99, 1961, 269-76.

Miller, J. W. "Measuring Perspective Ability", Journal of Geography, LXVI, April, 1967. P. 167-171.

Neale, J. M. "Egocentrism in Institutionalized and Noninstitutionalized Children", Child Development, 37, 1966, 97-102.

Pedde, M. L. "Children's Concepts of Base Area Symbols", Unpublished Masters Thesis, University of Alberta, 1966.

Piaget, J. Judgement and Reasoning in the Child. London: Kegan Paul, 1928.

_____. and Inhelder, B. The Child's Conception of Space. London: Routledge and Degan Paul, 1963.

_____. Six Psychological Studies. New York: Random House, 1967.

Shantz, C. U. and Watson, J. S. "Developmental Studies of Egocentrism", Mineographed, 1967, Merrill-Palmer Institute.

Towler, J. O. "Spatial Concepts of Elementary School Children", Unpublished Masters Thesis, University of Alberta, 1965.

APPENDIX A

TEST OF RIGHT-LEFT RELATIONSHIPS

(Unrevised Form)

Level I (E & S opposite)

Show me your right hand _____
Your left _____
Show me your right leg _____
Now your left _____

Level II (E & S opposite)

Show me my right hand _____
Now my left _____
Show me my right leg _____
Now my left _____

Level III (E & S opposite)

Is the pencil to the right or to the left of the penny? _____
And is the penny to the right or to the left of the pencil? _____

Level IV (S beside E)

Now is the pencil to the right or to the left of the penny? _____
And the penny? _____

Level V (E & S opposite)

Is the pencil to the right or to the left of the key? _____
And of the penny? _____
Is the key to the left or to the right of the pencil? _____
And of the key? _____

Level VI (S beside E)

Is the pencil to the right or to the left of theykey? _____
And of the penny? _____
Is the key to the left or to the right of the penny? _____
And of the pencil? _____
Is the penny to the left or to the right of the pencil? _____
And of the key? _____

TEST OF RIGHT-LEFT RELATIONSHIPS

(Revised Form)

Level I (E opposite S)

Show me your right hand _____
Show me your left hand _____
Point to your right leg _____
Point to your left leg _____

Level II (E opposite S)

Point to my right hand _____
Point to my left hand _____
Point to my right leg _____
Point to my left leg _____

Level III (E opposite S, E points to pencil, Pencil--Penny)

Is the pencil on the right side or the left side of the penny? _____
Is the penny on the right side or the left side of the pencil? _____

Level IV (S beside E, E points to pencil)

Is the pencil on the right side or the left side of the penny? _____
Is the penny on the right side or the left side of the pencil? _____

Level V (E opposite S, E points to pencil 1 & 2, key 3 & 4)

Is the pencil on the right side or left side of the key? _____
Is the pencil on the right or the left side of the penny? _____
Is the key on the right side or the left side of the pencil? _____
Is the key on the right side or the left side of the penny? _____

Level VI (S beside E, E points to pencil, key, penny)

Is the pencil on the right side or the left side of the key? _____
Is the pencil on the right side or the left side of the penny? _____
Is the key on the right side or the left side of the penny? _____
Is the key on the right side or the left side of the pencil? _____
Is the penny on the right side or the left side of the pencil? _____
Is the penny on the right side or the left side of the key? _____

APPENDIX B

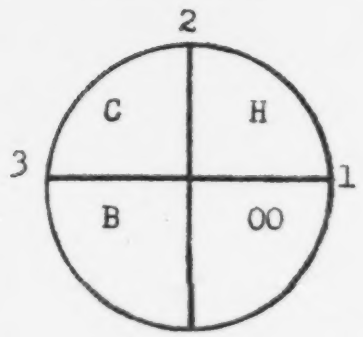
TEST OF COORDINATION OF PERSPECTIVES

SCORE SHEET

Subject_____ ID#_____ School_____

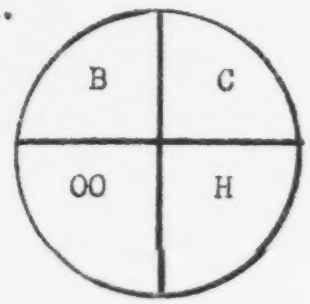
Room_____ Grade_____ SES_____ CA_____ IQ_____

Subtest I
(SEQUENCE)

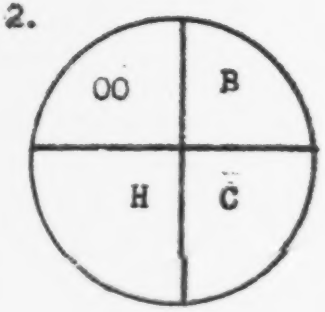


Subject

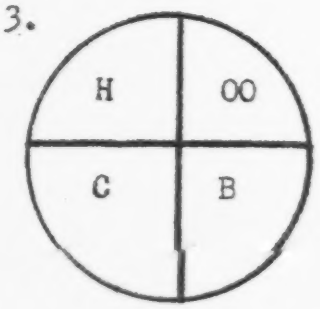
1.



2.



3.

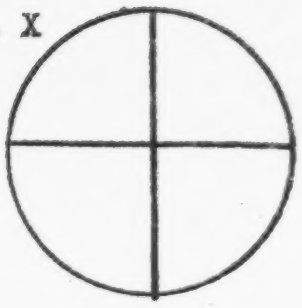


Subtest II (E places man, S chooses picture)

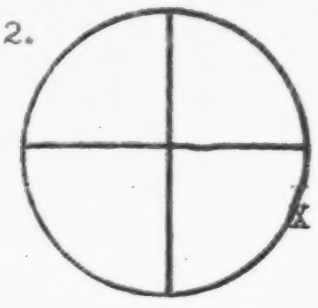
1._____ 2._____ 3._____ 4._____ 5._____

SubtestIII (E gives S picture, S places man)

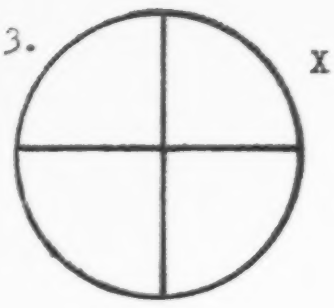
1. X



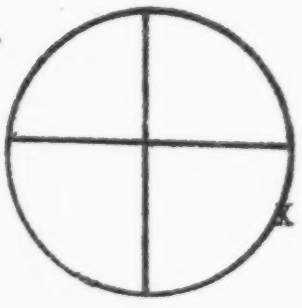
2.



3.



4.



5.